

Linux

exam preparation with syllabus.

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1. linux history and operations.

+ Evolution of linux:-

- free and open source operating system
- based on linux kernel
- Released at early nineties by linus Torvalds
- designed intel x86 architecture
- os can be used on TOP500 supercomputer
- linux also used in embeded system and larger in mechanical and electrical system
- 1992 (linux 0.12 under the GNU-General Public license.)
- 1994 (released 1.0 of linux , XFree86 project)
- red hat & SUSE published this version
- 1995 is ported DEC Alpha & sun SPARC
- ^{1996.} release version 2.0 & it is using symmetric multi-processing and serious alternative for many companies.
- 1998 IBM, Compaq and oracle announced their support for linux
- 1999 IBM announces an extensive project for the support for linux
- 2000 Dell announced it is number 2 provider of the linux based system & first major manufacturing across the full product line.
- 2002 microsoft "killed" Dell linux
- 2004 Xfree86 team is substantially faster development of the x server for linux
- 2005 project openSUSE begins , project openOffice.org introduces
- 2006 oracle releases its own distribution of Red Hat enterprise
- 2007 Dell starts distributing laptops with Ubuntu pre-installed on them.

- 2009 Red hat market capitalization equals ours interpreted as a symbolic moment for the linux based economy.
- 2011 A new update for the linux kernel, namely version 3.0 is released.
- 2012 The aggregate linux server market revenue exceeds that of the rest of the Unix market
- 2013 Google linux-based android systems claims 75% of the full on smartphone market
- 2014 Ubuntu claims 22 million users
- 2015 4th version of linux kernel is released.
- 2019 5th version of linux kernel is released. new features like AMD FreeSync display support, Raspberry Pi Touch screen support, Btrfs swapfile support

The GNU Movement and the GPL

- GNU is an extensive collection of free software, which can be used as an operating system and can be used in parts with other operating systems.
- The Use of the completed GNU tools led to the family of operating system popularly known as linux
- Most of GNU is licensed under the GNU projects own General public license
- GNU is also the project within which the free software concept originated.
- GNU is a recursive acronym for "GNU's not unix."
- It is design like Unix but containing no Unix code

Linux Operations as a server

- Linux server:- Linux server is an efficient, powerful variant of the linux open source operating system (os).
- Linux servers are built to address the ever increasing requirements of business applications like system

and network administration, web service and database management

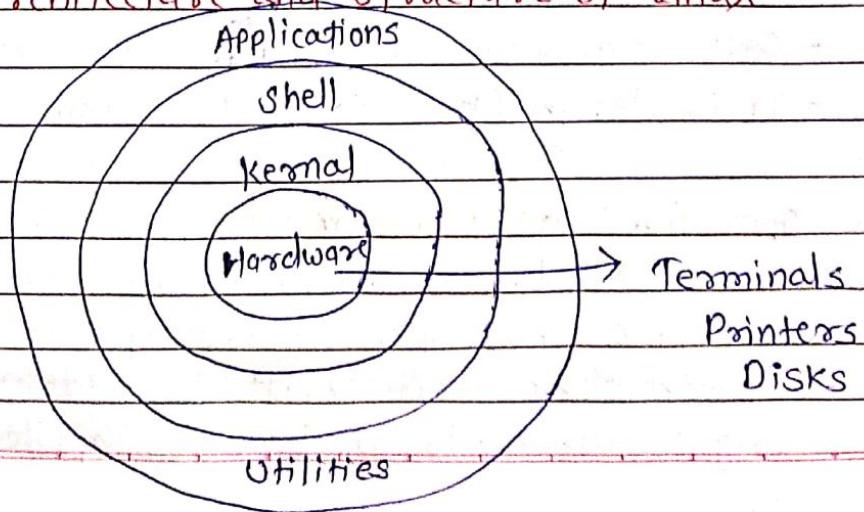
- Linux servers are often preferred over other server operating systems because of their reputation for
 1. Security
 2. Consistency
 3. Flexibility
 4. Stability
 5. Efficiency
 6. Networking
 7. Technical Support
 8. Multitasking
 9. No downtime
 10. Freely-distributed source code

- Some examples of Linux operating systems are

1. CentOS
2. Ubuntu Server
3. Gentoo
4. Debian
5. Slackware

- Here no need for a Graphical User Interface (GUI)
- Commands executed via Command prompt.

The Architecture and Structure of Linux



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1. Kernel:- The kernel is one of the core section of an operating system. It is responsible for each of the major actions of the linux OS.

- This operating system contains distinct types of modules and cooperates with underlying hardware directly.

- monolithic Kernel
- micro Kernels
- Exo kernels
- Hybrid kernels

2. System Libraries:- These libraries can be specified as some special functions. These are applied for implementing the operating system's functionality and don't need code access rights of the modules of kernel.

3. System Utility Program:-

It is responsible for doing specialized level and individual activities.

4. Hardware Layer:-

Linux operating system contains a hardware layer that consists of several peripheral devices like CPU, HDD and RAM

5. Shell:- It is an interface among the kernel and user. It can afford the services of kernel. It can take commands through the user and runs the functional of the kernel. The shell is available in distinct types of oses. These operating system categorized into two different types which are

1. Graphical shell

2. Command line shell

Types of shells

- korn shell
- Bourne shell
- C shell
- POSIX shell

Installing and Configuration Linux (Ubuntu and CentOS)

- Introduction to installation and media Types

* installation in Ubuntu

1. Overview

2. Requirements

3. Boot from install media

4. choose your language

5. choose a correct keyboard layout

6. choose your install

7. Networking

8. Configure storage

9. select a device

10. Confirm partitions

11. Confirm changes

12. set up a profile

13. install software

Perform a Custom linux server installation

Run levels and the startup/shutdown Sequence

Logging In and Out of a linux system.

⇒ Do above things practically in virtual machine with Ubuntu, Centos

Basic Commands:-

⇒ Run it personally on Ubuntu or centos

Gaining confidence with linux

- Access control list and chmod command

what is ACL?

Access control list (ACL) provides an additional, more flexible permission mechanism for file system. It is designed to assist with UNIX the file permissions

- ACL allows you to give permissions for any user or group to any disc resource

- ACL are used to make a flexible permissions mechanism in linux.

- Linux man pages, ACL's are used to define more fine-grained discretionary access rights for files and directories.

- setfacl and getfacl are used for setting up ACL and showing ACL respectively

- e.g. getfacl test/declarations.h

* chmod command:

- To change directory permissions in linux use the following

1. chmod +rwx filename to add permissions.

2. chmod -rwx directoryname to remove permissions.

3. chmod +x filename to allow executable permission.

4. chmod -wx filename to take out write and executable permissions

r is for read

w is for write

x is for execute

change directory permissions in linux for the group owners and others

g is for group

o is for users.

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- chmod g+rw filename
- chmod g-rwx filename
- chmod o+rw filename
- chmod o-rwx foldername

To change directory permissions for everyone, use

'u' for users

'g' for group

'o' for others

'ugo' or 'a' for all

- chmod ugo+rwx foldername to give read, write and execute to everyone
- chmod a=r foldername to give only read permission for everyone

chmod 777 foldername - All permission for everyone.

chmod 700 foldername - All permission for user only

chmod 327 foldername - Write & execute for user

Write for group

All for other users.

chown and chgrp commands :

chown - changing ownership of files and directories in linux

- chown name filename

- chown name foldername

Also combine the group and ownership command by using

- chown -R name:filename / home / name / directory name:
- R stands for recursive

chgrp - change group of files and directories in linux

You can change groups of files and directories in linux

- `chgrp groupname filename`
- `chgrp groupname foldername`

Commands like 1. telnet

- It helps to connect to a remote linux computer.
 - run programs remotely and conduct administration.
 - utility is similar to the remote desktop feature found in windows machine
- `telnet hostname = "" or = "`
e.g. `telnet localhost`
- the utility will ask you username & password
 - commands will be executed on the remote machine and not your local machine
 - exit the telnet connection entering the command
`'logout'`

2. SSH

- which stands for secure shell it is used to connect to a remote computer securely
 - widely used by system administrators to control remote linux servers.
 - Syntax is `SSH username@ip-address or hostname`
- `ls`
`pwd`

3. ftp

- FTP is file transfer protocol. It's the most preferred protocol for data transfer amongst computers
- we use FTP to
 - logging in and establishing a connection with a remote host
 - upload and download files

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- Navigating through directories
- Browsing contents of the directories.
ftp hostname = "" or = ""
it will ask authentication username and password

4. SFTP:

Secure file transfer protocol runs over ssh port on standard port 22 by default to establish a secure connection.

- SFTP has been integrated into many GUI tools.
sftp tecmint@27.48.137.6

Basic of I/O system with mount and umount

mount :- Command mounts a storage device or filesystem making it accessible and attaching it to an existing directory structure.

mount [-lhnv]

mount -a [-ffnrvsw] [-t vfstype] [-o optlist]

mount [-fnrvsw] [-o option[,option]...] deviceldir

mount [-fnrvsw] [-t vfstype] [-o options] deviceldir

standard form

mount -t type device dir

directory or device

mount /dir

Three forms of the mount

mount -h

Prints a help message, and exits;

mount -v

mount version information, and exits

`mount [-t] [-f type]`

the command

`mount -a [-t type] [-o optlist]`

`mount /dev/foo/dir`

`mount device|dir -o options.`

`mount /dev/cdrom`

`mount /cd`

`mount -- bind olddir newdir`

`mount -B olddir newdir`

as an fstab entry:-

`/olddir /newdir none bind`

`mount -o remount,ro newdir.`

`mount --move olddir newdir`

or shortoption

`mount -m olddir newdir`

Umount

command "unmounts" a mounted filesystem, informing the system to complete any pending read or write operations, and safely detaching it.

`umount [-hv]`

`umount -a [-dfnrv] [-t vfstype] [-o options]`

`umount [-dfnrv] {dir|device}...`

Features and different modes of vi editor

- The VI editor is the most popular and classic text editor in the linux family
- it is available in almost all linux distributions
- it works the same across different platforms and distributions
- It is user friendly, hence millions of linux users love it and use it for their editing needs

Vi Command mode:-

1. The vi editor open in this mode and it only understand commands.
2. In this mode, you can move the cursor and cut, copy paste the text
3. This mode also saves the changes you have made to the file
4. Commands are case sensitive. You should use the right letter case

Vi editor insert mode:-

1. This mode is for inserting text in the file
2. You can switch to the insert mode from command mode by pressing 'i' on the keyboard.
3. Once you are in insert mode, any key would be taken as an input for the file on which you are currently working
4. Return to the command mode & save the changes you have made you need to press the Esc key.

Editing using vi editor

1. Select the file by typing vi index.sh at the command line

2. Use the arrow keys to move the cursor to the part of the file you want to change.
3. Use the `i` command to enter insert mode.
4. Use the delete key and the letters on the keyboard to make the correction.
5. Press the Esc key to get back to normal mode.
6. Type a colon (`:`) to move the cursor to the bottom of the screen.
7. Type `esc:wq!`

Find and Replace Command

Find and replace text within a file using sed command

1. Use stream editor (sed) as follows:
 2. `sed -i 's/old-text/new-text/g' input.txt`
 3. The '`s`' is the substitute command of sed for find & replace.
 4. It tells sed to find all occurrences of 'old-text' and replace with 'new-text' in a file name `input.txt`.
 5. Verify that file has been updated.
 6. `more input.txt`
- `5/ found expression foo`
`9/ means global replace.`

Cut-Copy-Paste Command.

`ctrl+w` : cut the word before cursor and add it to the clipboard buffer.

`ctrl+k` : cut the part of the line after the cursor, and add it to the clipboard buffer. If the cursor is at the start of the line it will cut and

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copy the entire line

`Ctrl + U` :- Cut the part of the line before the cursor, and add it to the clipboard buffer. If the cursor is at the end of the line, it will cut & copy the entire line

`Ctrl + Y` :- Paste the last text that was cut and copied

Cut

`dd`

old delete current line completely.

copy

`yy`

`yy` is used to copy a line

Paste

`p`

Paste a copied or cut content after the current line

The set command

Linux set command is used to set and unset certain flags or setting within the shell environment

- The flags and settings determine the behaviour of a defined script and help in executing the tasks without facing any issue

`set [options]`

To turn on debugging information

`set -x`

To turn off debugging information

`set +x`

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disable default behaviour of Bash

set -C

stop a script immediately

set -e

Getting help

set --help

other related command by vi

⇒ I share text file to

Linux Shell Programming

- introduction to shells

a) what is shell

- A shell provides you with an interface to the unix system. It gathers input from you and executes programs based on that point input.

- When a program finishes executing it displays that program's output.

- Shell is an environment in which we can run our commands, programs and shell scripts. There are different flavors of shell just there are different flavors of operating systems.

- Shell has its own set of recognized commands and functions.

- The prompt \$ which is called the command prompt is issued by the shell.

- Shell reads your input after you press enter.

Shell types :-

There are two major types of shells -

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Bourne shell - if you are using a Bourne type shell the \$ character is the default prompt

C shell - If you are using a C-type shell, the % character is the default prompt

The Bourne shell has the following subcategories -

- Bourne shell (sh)
- Korn shell (ksh)
- Bourne Again shell (bash)
- POSIX shell (sh)

The different C-type shell follow -

- C shell (csh)
- Tenex/TOPS C shell (tcsh)

Bourne Again shell (Bash)

- Bourne again shell (Bash) is a free unix shell that can be used in place of the Bourne shell. It is a complete implementation of the IEEE portable Operating System Interface for UNIX (POSIX) and open group shell specification.

- Bash is basically a command processor that typically runs in a text window, allowing the user to type commands that cause actions.

- It can read commands from a file, called a script.

Shell variables (Environmental variables, user defined)

- A shell variable is a special variable that is set by the shell and is required by the shell in order to function correctly.

- Some of these variables are environment variables whereas others are local variables.

Environment variables:-

- An environment variable is available to any child process of the shell. Some programs need environment variables in order to function correctly.

- Usually shell script defines only those environment variables that are needed by the program that it runs

Shell files (.bashrc, .profile, .bash_profile, .bash_logout)

- Providing a way for you to set up your account environment automatically when you log in and when you invoke another bash shell, and allowing you to perform commands when you log out.

- `.bashrc` → is executed for an interactive non login shell

- `.bash_login` → is read and executed when Bash is

- `~/.profile` → invoked as an interactive login shell

- `.bash_profile` →

- `.Bash_logout` → This file is executed when the user logs out.

Positional parameters

- A positional parameter is a parameter denoted by one or more digits, other than the single digit 0. Positional parameters are assigned from the shell's arguments when it is invoked and may be reassigned using the `set` builtin command.

- Positional parameters may be referenced as $\$[N]$ or as $\$N$ when N consist of a single digit.
 Positional parameter may not be assigned to with assignment statements

- The positional parameters are temporarily replaced when a shell function is executed.

- when a positional parameter consisting of more than a single digit is expanded, it must be enclosed in braces.

Get start with simple scripts (User variable, expr, multiple command)

ask to user for input then we use a command called `read`

→ it will save into a variable

`read var1`

Expr

- used for basic operation like addition, subtraction, multiplication, division and modulus on integers

- evaluating regular expressions, string operations like substring, length of strings etc.

`$ expr expression`

Wild cards (* and ?)

A wildcard is a symbol that makes the place of an unknown character or set of characters. Commonly used wildcards are the asterisk (*) and the question mark (?).

- Depending on the software or the search engine

you are using, other wildcard characters may be defined

- cheese*
- *cheese
- dir*.old
- ls *.old

The question mark (?)

take?.txt

home ??.*

Command line arguments

An argument, also called command line argument can be defined as input given to a command line to process that input with the help of given command

- Argument can be in the form of a file or directory
- Arguments are entered in the terminal or console after entering command . They can be